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## DRAWINGS ATTACHED

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## (54) IMPROVEMENTS IN THE MANUFACTURE OF PROSTHESES AND SPLINTS

(71) We, J. E. HANGER AND COMPANY LIMITED, a British Company, of Roehampton House, Roehampton Lane, London, S.W. 15, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns improvements in the manufacture of prostheses, that is artificial means for the making up of deficiencies in parts of the human body, whether such deficiencies are congenital or accidental, and splints.

Human-weight-supporting devices, such as artificial limbs and splints, require to be both light and strong and for this reason aluminium alloys and light wooden materials are commonly used in their construction.

The development of carbon fibre has opened up new fields of possibilities in many industries, and it is an object of the present invention to apply the properties of the new material to the construction of efficient prosthetic devices, and splints.

According to the invention we provide a method of making a human-weight-supporting device, such as an artificial limb or a splint, comprising moulding plastics material about a suitably modified (as herein defined) plaster cast of the patient's stump or deformity, covering the said plastics material with a layer of woven material serving to anchor on its outer surface carbon fibre tows in locations to be subjected to load, applying a further layer of woven material and laminating the two layers and tows together with plastics material.

The expression "suitably modified" means modified by relieving areas of high sensitivity or pressure and accentuating areas suitable for load-bearing.

The invention further includes devices made by the above method.

In the case of an artificial limb the prosthetic device may include a stump socket and may be a single moulding.

In the case of load-bearing splints the device may comprise two or more moulded pieces conjoined by hinges or flexible material to permit them to be wrapped about an injured or deformed limb.

The above and other claimed features are embodied in the following description of a particular prosthetic device and the process of its manufacture, which will now be described by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a diagrammatic side elevation of a deformed lower leg.

Fig. 2 is a diagrammatic side elevation of a carbon fibre lay-up on a stocking-covered, modified cast of the leg.

Fig. 3 is a perspective showing of a partially finished prosthesis fitted with a walking shoe.

Fig. 4 is a perspective showing of a completed prosthesis.

The patient is a child suffering from the equinus varus deformity, with shortened shin and dropped foot as shown in Fig. 1.

A plaster cast is taken of the deformed limb to produce a female replica of the deformity. This female mould is then filled with plaster of paris to make a male model of the limb.

This male cast is then modified to relieve areas of high pressure or areas of sensitivity and to accentuate areas which are anatomically suitable for load-bearing.

About this modified cast is moulded a plastics socket, which will be comfortable and fits the extremity. The socket in this instance is comprised by four sections, one embracing the calf, heel and sole of the foot, one embracing the lower shin and front of the foot and a pair of flaps covering the sides of the shin.

An artificial foot A with a wooden block or foam material as a filler is attached to the socket to give the correct length and alignment to the ground. The patient then wears this for trial and any necessary modifications are incorporated.

A woven glass stocking is pulled over the plastics stump moulding, from which the pha-

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5 langes have been removed and over the artificial foot. Carbon fibre tows B which have been pre-treated with the laminating resin later to be employed are laid over and anchored to the stocking by tacking in continuous strands under the heel of the foot and up each medial and lateral side of the moulding. A second tow C is laid posteriorly down the calf area and under the heel and up the front of the foot.

10 A second woven glass stocking is now carefully pulled over the lay-up and then laminating plastics material, in this instance a resin, is introduced in the normal way.

15 The resultant reinforced laminate is cut as shown partially in Fig. 3, trimmed and lined as necessary as shown in Fig. 4, and is found to be of good appearance and to have excellent load-bearing qualities.

20 It will be understood that the invention is not restricted to the details of the specific embodiment described which may be varied without departing from the scope of the following claims.

25 WHAT WE CLAIM IS:—

1. A method of making a human-weight-

supporting device, such as an artificial limb or a splint, comprising moulding plastics material about a suitably modified (as defined herein) plaster cast of the patient's stump or deformity, covering the said plastics material with a layer of woven material serving to anchor on its outer surface carbon fibre tows in locations to be subjected to load, applying a further layer of woven material and laminating the two layers and tows together with plastics material.

2. A device made according to claim 1 and being an artificial limb including a stump socket.

3. A device made according to claim 1 and being an artificial limb constituted by a single moulding.

4. A device made according to claim 1 and being a load-bearing splint comprised by two or more moulded pieces flexibly conjoined.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

FIG.1



FIG.2

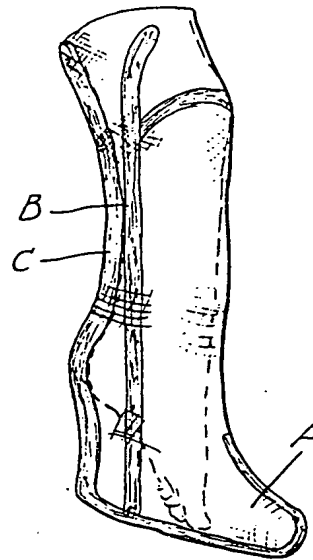


FIG.3

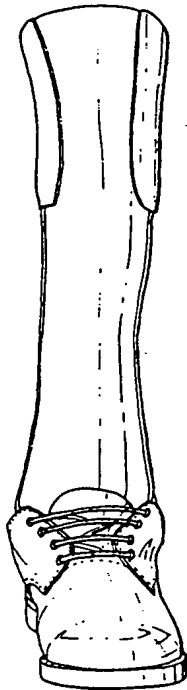


FIG.4

